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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/805,807	03/22/2004	Ashish Singhal	081445-0359	9961

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EXAMINER

SAINT SURIN, JACQUES M

ART UNIT	PAPER NUMBER
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2856

DATE MAILED: 02/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No. 10/805,807	Applicant(s) SINGHAL ET AL.	
	Examiner Jacques M. Saint-Surin	Art Unit 2856	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 19-36 is/are allowed.
- 6) ☒ Claim(s) 1-13, 17 and 18 is/are rejected.
- 7) ☒ Claim(s) 14-16 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. This Office Action is responsive to the amendment of 11/22/05.

Response to Arguments

2. Applicant's arguments with respect to claims 1-36 have been considered but are moot in view of the new ground(s) of rejection.
3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

5. Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Komura et al. (US Patent 6,629,058).

Regarding claim 1, Komura discloses a method for determining vibration amplitude limits to detect faults in mechanical equipment, comprising:

estimating a data probability distribution based on data for the mechanical equipment (when the amplitude probability density function is obtained from the vibration acceleration waveforms (1,000 pieces of sampling data are shown here) being generated by a normal bearing as shown in FIG. 1(a), it substantially agrees with the normal distribution as shown in FIG. 1(b), see: col. 4, lines 48-52);

and utilizing the data probability distribution to calculate the vibration amplitude limits (Fig. 7 is a view showing vibration acceleration waveforms being generated by a bearing with a defect on its outer ring, see: col. 4, lines 36-41 and col. 10, lines 55-61).

Claim Rejections - 35 USC § 103

6. Claims 1-10 and 17 are rejected under 35 U.S.C. 103 as being unpatentable over Piety et al. (US Patent 5,922,963) in view of Cham et al. (US Patent 6,314,204).

Regarding claim 1, Piety discloses a method for determining vibration system, as shown in FIG. 1, is used by machine maintenance personnel to measure and analyze the vibration level of a machine 10 as part of a machine monitoring program, see: col. 4, lines 16-19). However, Piety does not disclose a probability distribution amplitude to detect faults in mechanical equipment (a machine vibration monitoring function. Cham et al. discloses computation of the probability density function of the model state involves two main stages: (1) state prediction, in which the prior probability distribution is generated from information known prior to the availability of the data, and (2) state update, in which the posterior probability is formed

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by updating the prior distribution with information obtained from observing the data. It would have been obvious to one having ordinary skill in the art at the time of the invention to utilize in Piety the probability distribution of Cham because in particular this information obtained purely from data observations can also be expressed as a probability density function, known as the likelihood function which is a multimodal (multiple peaks) function when a single data frame leads to multiple distinct measurements from which the correct measurement associated with the model cannot be distinguished. Therefore, the above combination would be able to determine effectively the vibration amplitude limits based on obtained data using the probability distribution function.

Regarding claim 2, Piety discloses all of the data is used to determine a vibration level outer limit beyond which "outliers", or vibration levels lying outside the valid range, are rejected, see: col. 14, lines 11-13.

Regarding claim 3, it is similar in scope with claim 1 and therefore is rejected for the reasons set forth for that claim. Furthermore, Piety discloses the analysis performed by the base computer 14 and the portable vibration analyzer 12 includes processes, carried out by software instructions, which convert the vibration data into vibration frequency spectra, determine if the machine's vibration level has exceeded defined limits, and report to the machine maintenance personnel whether the limits have been exceeded by the measured data, see: col. 4, lines 27-33.

Regarding claims 4-5, Piety discloses a method is provided for constructing an alarm limit based on a plurality of machine vibration spectra. This method is applicable

to machines for which some historical vibration data is available (or can be extrapolated from other similar machines) but an insufficient amount of historical data is available to be considered statistically significant. The steps of this method include providing a plurality of vibration spectra corresponding to vibration generated by at least one machine. Each of the vibration spectra provided will include a plurality of peaks where each peak has an amplitude component and a frequency component. A mean vibration spectrum is determined where each amplitude of the mean spectrum represents the statistical mean of all corresponding amplitudes of the plurality of vibration spectra. The mean vibration spectrum is divided into a plurality of frequency windows, and an alarm limit value is calculated for each window. Each alarm limit value represents a maximum vibration level above which the machine's vibration level is considered abnormal for the range of frequencies included in the particular window, see: col. 3, lines 3-22.

Regarding claim 6, Piety discloses an example would be taking all of the data previously measured on the motor of a motor/pump apparatus and using this data to create a single statistical spectrum, see: col. 12, lines 66-67 and col. 13, lines 1-2.

Regarding claims 7-10, Piety discloses a mean vibration spectrum is determined where each amplitude of the mean spectrum represents the statistical mean of all corresponding amplitudes of the plurality of vibration spectra. The mean vibration spectrum is divided into a plurality of frequency windows, and an alarm limit value is calculated for each window. Each alarm limit value represents a maximum vibration level above which the machine's vibration level is considered abnormal for the range

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of frequencies included in the particular window, see: col. 3, lines 13-18. Piety further discloses Once envelopes have been generated which accurately indicate a limit for acceptable machine performance, these envelopes are stored in the computer memory 42, the measurement device memory 24, or on a storage device 16, 34. These limit envelopes are then used as standards against which to compare machine performance as the conditions of the machines change over time. As mentioned previously, a particular envelope which has been constructed based on spectra measured on a family of similar machines may be used as a standard for all the machines in the family (col. 5, lines 47-56).

Regarding claim 17, Piety discloses a method and apparatus for effectively developing accurate narrowband envelopes for identification of faults in rotating machinery, see: col. 2, lines 19-21.

Regarding claims 11-13, Piety does not disclose or suggest the data probability distribution is calculated using a kernel density method. Cham discloses kernel functions are fitted to these peaks to represent the likelihood function as an analytic function. It would have been obvious to one having ordinary skill in the art at the time of the invention to utilize in Piety the techniques of Cham because the resulting posterior distribution is also multimodal and represented using a set of kernel functions. Therefore, in real-time, these technologies are used to compare actual process behaviour with expected normal behaviour as predicted by the model and as indicated by historical data of stored statistical analyses thereby ensuring the reliability of obtained results and making the above combination very effective.

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7. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Piety (US Patent 5,922,963) in view of Cham et al. (US Patent 6,314,204) and further in view of Whiteside (US Patent 6,438,981).

Regarding claim 18, Piety in view of Cham does not disclose a chiller or HVAC chiller (as required by claims 18-19, 24 and 31). Note that the analysis of Piety includes a plurality of data information which are applicable to different of machines or mechanical equipment. Whiteside discloses water chilling package 10 (col. 4, line 20 and Fig. 1). Whiteside further discloses the content of a representative computer monitor display portion addressing the "fault" arising when the actual power requirements of the chiller exceed the design rated power requirements for such chiller, see: col. 10, lines 20-23. It would have been obvious to one having ordinary skill in the art at the time of the invention to utilize In the combination of Piety in view of Cham the chiller of Whiteside because it is also a mechanical equipment that is subject to unsatisfactory performance conditions, including chiller vibration, low evaporator fluid temperature leaving the evaporator, and high supply oil to the compressor temperature, among others. Therefore, this combination would perform effectively the monitoring of the vibration amplitude limits of the chiller in an effective and efficient manner.

Allowable Subject Matter

8. Claims 14-16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. Claims 19-36 are allowable over the prior art of record.

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10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jacques M. Saint-Surin whose telephone number is (571) 272-2206. The examiner can normally be reached on Mondays through Fridays 10:30 A.M. -7:00 P.M..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron Williams can be reached on (571) 272 2208. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Jacques M. Saint-Surin
February 06, 2006



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